BLOCKCHAIN IN HEALTHCARE TODAY

Blockchain in Healthcare: 2023 Predictions From Around the Globe

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Abstract

Over the past 50 years, although categorized as the "Information Age" or "Digital Age," the vast amounts of digitized data have been sorely underutilized. Only recently, in response to the COVID-19 pandemic, efforts have accelerated to harness these data using blockchain technology as it pertains to healthcare.

Today, through the blockchain infrastructure and its tokenization applications, we are able to leverage healthcare data effectively into more efficient business processes. In addition, we can secure better patient engagement and outcomes, while generating new revenue streams for an array of healthcare stakeholders. It is in the application of blockchain technology to compile these stockpiled data into new, compliant business models that we can reap the full potential of the blockchain. Here are predictions by members of the BHTY editorial board members on how we might further advance the role of blockchain in healthcare in 2023.

Monetization, Consumerization of Health Data, and the Metaverse

Talisha Shine, MBA, CBE and Jane Thomason, PhD, MSc

The COVID-19 pandemic was an accelerator for blockchain in healthcare. We saw rapid advances in blockchain in information exchange, pandemic prediction, tracking, supply chain integrity, provenance, and payments. The COVID-19 pandemic removed barriers and accelerated the drive to care for patients remotely. We have become more reliant on data, and this trend will continue.

In the next few years, we will witness the monetization of health data through health data marketplaces, the consumerization of healthcare, and the growth of metahealth. When combined with rapidly growing smart phone penetration and increasing adoption of smart wearable devices, Web 3.0, "the internet of value," will underpin significant changes in healthcare.

Access to medical data is needed for training artificial intelligence (AI), drug development, scientific discovery, medical research, and precision medicine. Yet, much medical data are not being used or monetized. Blockchain and non-fungible tokens (NFTs) allow people to exchange value on a decentralized network.

Humans are also being digitalized with new devices, apps, and monitoring technologies that generate extraordinary volumes of data. This will enable data owners to monetize their data, leading to the development of health data marketplaces, which connect and monetize data for data owners, making it available for scientific discovery. The progress in self-sovereign identity will make it possible for individuals to monetize their health data in the future.[1]

Consumerization of healthcare will create opportunities for new players with low-cost, convenient services. People will expect on-demand healthcare, and consumers will want to access their health records literally in the palm of their hands. Health data will become the new healthcare currency, leading to operational savings, improved treatment effectiveness and safety, faster diagnosis, and the possibility of personalized medicine. The growing focus on data analytics will turn medical devices into commodities, with patient-level data and the surrounding analytics becoming an essential source of revenue for digital health companies.

Another significant change to watch will be the metaverse, the next iteration of the internet, as an immersive, always-on experience. The metaverse is an amalgamation of blockchain, virtual reality (VR, using a real-world setting), augmented reality (AR, an immersive virtual environment), as well as mobile and computer technologies. In the future, we will increasingly see the metaverse used to change, enhance, and transform healthcare. The leading use cases are collaborative working, education, clinical care, wellness, and monetization.[2] In non-communicable diseases, there is potential to deploy the metaverse using gamification and incentives, as well as for education and care.[3] Future healthcare metaverse ecosystems are being built, and surgeons have already performed AR procedures on live patients.[4] Web 3.0 open metaverse will democratize access, allow peer-to-peer transactions, and give everyone free access to this immersive space.

Wearable Devices and Digital Twins
Imtiaz Khan, PhD and Mohamed Maher, MBA

In recent years, we witnessed a sharp rise of wearable devices, like the smart watch, capable of measuring key health parameters with high precision in real-time.[5] Despite the growing use of smart watches and similar healthcare wearable devices,[6] in the context of smart and connected healthcare aspirations of healthcare 4.0, the opportunities and transformative power the smart watch derived data (SWDD) are yet to be realized. In coming years, we will begin to realize the value proposition of SWDD, as well as how blockchain-like distributed and decentralized technologies can make that realization a reality.

Under traditional healthcare systems, ownership and stewardship of health data lie with healthcare service providers and are considered as the data producer. With SWDD, the paradigm is reversed by replacing these providers with individuals as the data producer. From a health data consumer perspective (i.e. medical professionals, researchers, pharmaceuticals, and policy makers), the availability of high-volume real-time health data along with environmental parameters (e.g. location, time of day, weather) will forge a new type of data that can provide a holistic spatiotemporal view at personal level. These real-time contextual personal data will bring a paradigm shift in terms of value creation, since different machine learning and analytical techniques can be utilized for prognosis, discovery, diagnosis, treatment, and follow-up purposes. Traditional cross-sectional and retrospective health data limit the use of machine learning algorithms and are confined to statistical analysis that has limited predictive and decision-making capability.

With the change of ownership and new role as data producer, individuals will start to perceive SWDD as NFT-like digital assets. This perception will create the demand to establish a digital health data marketplace,[7] where, similar to the accommodation sharing economic model of Airbnb, individuals can earn revenue by sharing their SWDD. Real-time contextualized SWDD will also enable us to create industry 4.0 digital twins for healthcare 4.0 as well as avatars in the metaverse. These digital twins and avatars will provide a new AI-assisted approach for monitoring and measuring our physical and mental health. Asymptomatic diseases, such as stroke or mental health diseases like depression (a leading cause of disability, worldwide),[8] will benefit from this approach, as new insights about the progression of these diseases will be revealed.

Blockchain technologies will be the enabler for the creation of such a marketplace. Smart contracts will ensure fair distribution of revenues within the stakeholders, cryptography—privacy and security and cryptocoin—global micro transactions of revenues. The competition ethos of a free market economy will promote data qualit, while participation of global community promotes quantity health data. Availability, accessibility, and ability to choose the right dataset at right time will boost medical services and discovery.

Privacy of Blockchain in Healthcare
Kohei Kurihara

In 2023, privacy will become one of the most significant topics, with blockchain in healthcare deploying new services at practical levels. On the application layer, some healthcare services were concerned with selling patient data for commercial purposes. Under the research of Duke Clinical Research Institute, Duke University, Durham,[9] the medical privacy regulation uncertainty covers the fundamental protection to share data with the first party against the restriction to disclose the patient's agreement.

Health Insurance Portability and Accountability Act (HIPPA) of 1996 (a U.S. federal law requiring creation of national standards to protect sensitive patient health information from being disclosed without the patient's consent or knowledge) and General Data Protection Regulation (GDPR, a European Union regulation on data protection and privacy) undermine the healthcare surveillance economy, but decentralized application is also applied to the legitimate requirement. Earlier this year, a blog from the U.S. Federal Trade Commission announced "The Commission is committed to using the full scope of its legal authorities to protect consumers' privacy.[10] We will vigorously enforce the law if we uncover illegal conduct that exploits Americans' location, health, or other sensitive data and investigate illegal action regardless of decentralized infrastructure, but prioritize the consumer safety and concerns.

Healthcare data are no longer the information from hospitals and medical care centers that is censored in our home or physical devices such as smart watches. Location data become more sensitive to use for commercial purposes. Blockchain has the capacity to integrate, under a secure decentralized network, an application causing the claim from regulatory authorities.

To predict the risk against healthcare data abuse, blockchain experts should consider multiple actions in 2023 as follows:

1. Proper risk assessment containing application layer
2. Third party and network evaluation
3. Cross-border healthcare data transfer

Risk assessment is not sufficient with security checkboxes because risk categories are diversified and enlarge the definition of sensitive data. A few years ago, location data were not a pain point for commercial utilities, but regulatory authorities have changed their stance for vigorous enforcement in accordance with the transition from social feedback.

Compliance is the methodology for the patients to access healthcare service safeguards. In addition, application providers should reconsider the definition of compliance with an eye on diversifying products.

Patients will find that third party connections will be beneficial for monitoring their status and for personalized medical care with comprehensive data integration, although they prohibit sharing the patient's data with commercial third parties such as advertisers or e-commerce platforms. Blockchain has an essential benefit to develop a wider network on a holistic system and process the data automatically. Of course, this system is superior to a centralized database but embraces the impact with wrong connections.

Cross-border healthcare data become realistic by lower server cost on the cloud; however, cloud systems rely on local regulation and government action to access corporate databases in case of national emergency. The EU and USA have promised to commit to a mutual relationship to create a new framework in consecutive data flows based on the same level of data protection. Blockchain may have to follow when it comes to the selection on chain or off chain to store patient data. It explicitly falls on the healthcare industry to use patient data under different jurisdictions. Changes in 2023 will exhibit an important shift to the application level in order to apply new rules of regulatory regimes.

Blockchain Enabled Patient-Mediated Healthcare Exchange

Osama El-Hassan, PhD

Today, we still have very few convincing blockchain enabled solutions for healthcare. This is due to the complexity of the domain and the nature of healthcare data, which is still relatively large, unstructured, and amenable to changes.

In 2023, I predict there will be greater emphasis on utilizing blockchain to enable patient-mediated healthcare exchange, especially with pharma and clinical trials platforms. Patients with interesting data (e.g. rare diseases) will be able to monetize their information as NFT. Additionally, blockchain technology will find its way to empower the workforce through talent management and career development frameworks that provide incentives for training, mentoring, and knowledge-transfer through digital attraction (i.e. cryptocurrencies-based rewards).

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